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PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1906.

BY MALCOLM MCNEILL.

PHASES OF THE MOON, PACIFIC TIME.

Last Quarter.	Nov.	9,	1^h 45^m	A.M.	Last Quarter..	Dec.	8,	5^h 45^m	P.M.
New Moon...	"	16,	12 36	A.M.	New Moon....	"	15,	10 54	A.M.
First Quarter.	"	22,	4 39	P.M.	First Quarter.	"	22,	7 4	A.M.
Full Moon...	"	30,	3 7	P.M.	Full Moon....	"	30,	10 44	A.M.

The winter solstice, the time when the Sun begins its northward motion and winter begins, comes on December 22d, about 10 A.M., Pacific time.

Mercury is an evening star on November 1st, setting not quite an hour after sunset. This interval increases slightly, and is a little over an hour at the middle of the month. The planet reaches greatest east elongation (23° 0′) on November 9th, and after a few days begins to approach the Sun quite rapidly. It passes inferior conjunction with the Sun on the evening of November 29th and becomes a morning star. After that it moves rapidly out toward greatest west elongation, and reaches this situation on December 18th. It then rises more than an hour and three quarters before sunrise, and the interval diminishes only slightly during the rest of the month, being not quite an hour and one half on December 31st. It will therefore be in good position for observation on any clear morning after about December 10th.

Venus is still an evening star on November 1st, setting not quite an hour and one half after sunset. By the middle of the month it is less than one hour behind the Sun, but may still be seen in the evening twilight. It reaches inferior conjunction on November 29th and becomes a morning star. After that it moves rapidly away from the Sun on a path which carries it considerably to the north of the Sun, so that by December 16th it rises two hours before and on December 31st three hours before sunrise.

The relative motions of *Mercury* and *Venus* during November and December are interesting. On November 1st both are evening stars, *Venus* being about 12° farther from the Sun than *Mercury*. *Mercury* keeps on increasing its distance from the Sun until November 9th, while *Venus* continually approaches it. On the evening of November 14th *Venus* overtakes and passes *Mercury*, the nearest approach being about 2°, *Venus* south. Both are still far enough away from the Sun to be seen in the evening twilight, if the weather is good. *Venus* is now ahead in the race toward the Sun, but *Mercury* soon begins to gain and reaches conjunction with the Sun only an hour after *Venus*, on November 29th. It overtakes and passes *Venus* fifteen hours later, but both planets are of course too near the Sun to be seen. They are now morning stars, both receding from the Sun, but *Mercury's* burst of speed soon gives out, and *Venus* overtakes and passes it on the morning of December 15th, *Venus* being a little less than 1° south. Both of the planets are now far enough away from the Sun to be seen in the morning twilight.

Mars is now a morning star, gradually increasing its distance from the Sun. On November 1st it rises at about 3:30, and on December 31st at about 2:30. During this period it moves about 35° eastward and 14° southward through *Virgo*. On November 14th it passes a little more than 1° south of the third-magnitude star γ *Virginis*, and on December 3d about 3° north of the first-magnitude star *Spica*, α *Virginis*. By the end of December its distance from the Earth will have diminished to about seventy per cent of the maximum which it had in July, and its brightness will consequently have just about doubled. It will be nearly as bright as the first-magnitude star *Spica*, which is near it through December.

Jupiter is getting into good position for observation in the eastern sky in the evening. On November 1st it rises at a little before 9 P.M., and at a little before sunset on December 31st. It comes to opposition with the Sun on the morning of December 28th. It is in the western part of the constellation *Gemini*, and its motion is retrograde, about 6° westward. It is south and west of the principal stars of *Gemini, Castor* and *Pollux,* and in the general direction of *Aldebaran,* the brightest star in *Taurus,* but rather nearer the former pair.

Saturn is also in good position for evening observation, but is in the southwestern sky. It remains above the horizon until about 1:30 A.M. on November 1st, and on December 31st does not set until nearly 10 P.M. It is in the eastern part of *Aquarius* and moves slowly westward until November 12th. After that it moves eastward and northward about 2°. The apparent breadth of the rings begins again to diminish, but does not become as small as it was in June.

Uranus is also in the western sky in the evening, but is considerably nearer the Sun than is *Saturn.* It sets shortly after 8 P.M. on November 1st, and the apparent distance from the Sun diminshes until the planet comes to conjunction on December 30th. It is still in the constellation *Sagittarius,* and moves about 3° eastward during the two months. The nearest bright star is still λ *Sagittarii.* After December 1st the planet will be too near the Sun for naked-eye view.

Neptune rises about 9 P.M. on November 1st, and before 5 P.M. December 31st. It is still in *Gemini.*